APPENDIX A

DESIGN EXAMPLES

A-1. Example of a nonreinforced rigid pavement design. Let it be required to design a nonreinforced rigid pavement for a road in a rural area on rolling terrain, to carry the following traffic:

Average daily volume	3,500 vehicles per lane
Trucks, 2-axle	150 per lane per day
Trucks, 3 or more axles	50 per lane per day

In accordance with EM 1110-3-130 and based on the definitions of traffic categories given previously, this traffic would be evaluated as requiring a Class C road designed for Category IV traffic. However for mobilization work, Class C translates to a Class B pavement. From table 5-1, the rigid pavement design index for a B-IV pavement is 4. Assuming a 28-day flexural strength for the concrete of 675 lb/in^2 and a modulus of subgrade reaction of 100 lb/in^3, the required pavement thickness as indicated by figure 5-1 is approximately 7.3 inches. Since the fractional thickness is greater than 1/4 inch, the design thickness would be 8 inches. To illustrate the design procedure when traffic includes track-laying vehicles, assume that in addition to the pneumatic-tired traffic used in the previous example, the designer must provide for an average of 60 tanks per lane per day and that the gross weight of each tank is 50,000 pounds. The 50,000-pound gross weight would be classified as Category V traffic since it exceeds the maximum of 40,000 pounds permitted for track-laying vehicles in Category IV. Inasmuch as the tank traffic exceeds 40 per day, the rigid pavement design index would be based on the next higher traffic volume given in table 5-1, which is 100 per day. Thus from table 5-1, the design index for a Class B street would be 5. Assuming the same 28-day flexural strength and modulus of subgrade reaction as in the previous example, the required pavement thickness as indicated by figure 5-1 is approximately 7.9 inches and would require a design thickness of 8 inches. To illustrate the procedure for combining both forklift trucks and track-laying vehicles with pneumatic-tired vehicles, let it be required to design a rigid pavement on rolling terrain for the following traffic:

Average daily volume	750 vehicles per lane
Trucks, 2-axle	100 per lane per day
Trucks, 3 or more axles	40 per lane per day
Track-laying vehicles, 50,000 pounds	50 per lane per day
Track-laying vehicles, 80,000 pounds	20 per lane per day
Forklift trucks, 25,000 pounds	2 per lane per day

In accordance with EM 1110-3-130, this traffic on rolling terrain would be evaluated as requiring a Class D road or Class E street. From table 5-1, the 50-kip, track-laying vehicles are classified as Category V traffic. For a frequency of 50 of these vehicles per lane per day, the rigid pavement design index would be 5. The 80-kip, track-laying vehicles are classified as Category VI traffic. For a frequency of 20 of these vehicles per lane per day, the rigid pavement design index would be 6. The 25-kip, forklift trucks are classified as Category VII traffic. For a frequency of two of these vehicles per lane per week, the design index would be 5. Thus it can be seen that the 80-kip, track-laying vehicle traffic is the governing factor as it requires the highest design index. Assuming the same 28-day flexural strength and modulus of subgrade reaction as in the previous design examples, the required pavement thickness from figure 5-1 is 9.0 inches.

A-2. Example of a reinforced rigid pavement design. Let it be required to design a reinforced rigid pavement for the same set of conditions used in example A-1. Using the value of h_d of 7.5 inches, the percentage of longitudinal reinforcing steel S required to reduce the pavement thickness to 7 inches obtained from figure 6-1 as 0.07 percent. Similarly, the percentage of longitudinal reinforcing steel required to reduce the pavement thickness to 6 inches is 0.21 percent. The percentage of transverse reinforcing steel would be either 0.035 for a design thickness of 7 inches or 0.11 for a design thickness of 6 inches. The choice of which percentage of steel reinforcement to use should be based on economic considerations as well as on foundation and climatic conditions peculiar to the project area. If the yield strength of the steel is assumed to be 60,000 lb/in^2, the maximum allowable spacing of the transverse contraction joints would be 38 feet for 0.07 percent longitudinal steel, and 76 feet would be indicated as the maximum spacing for 0.21 percent longitudinal steel. In the latter case, the maximum permissible spacing of 75 feet would be used.